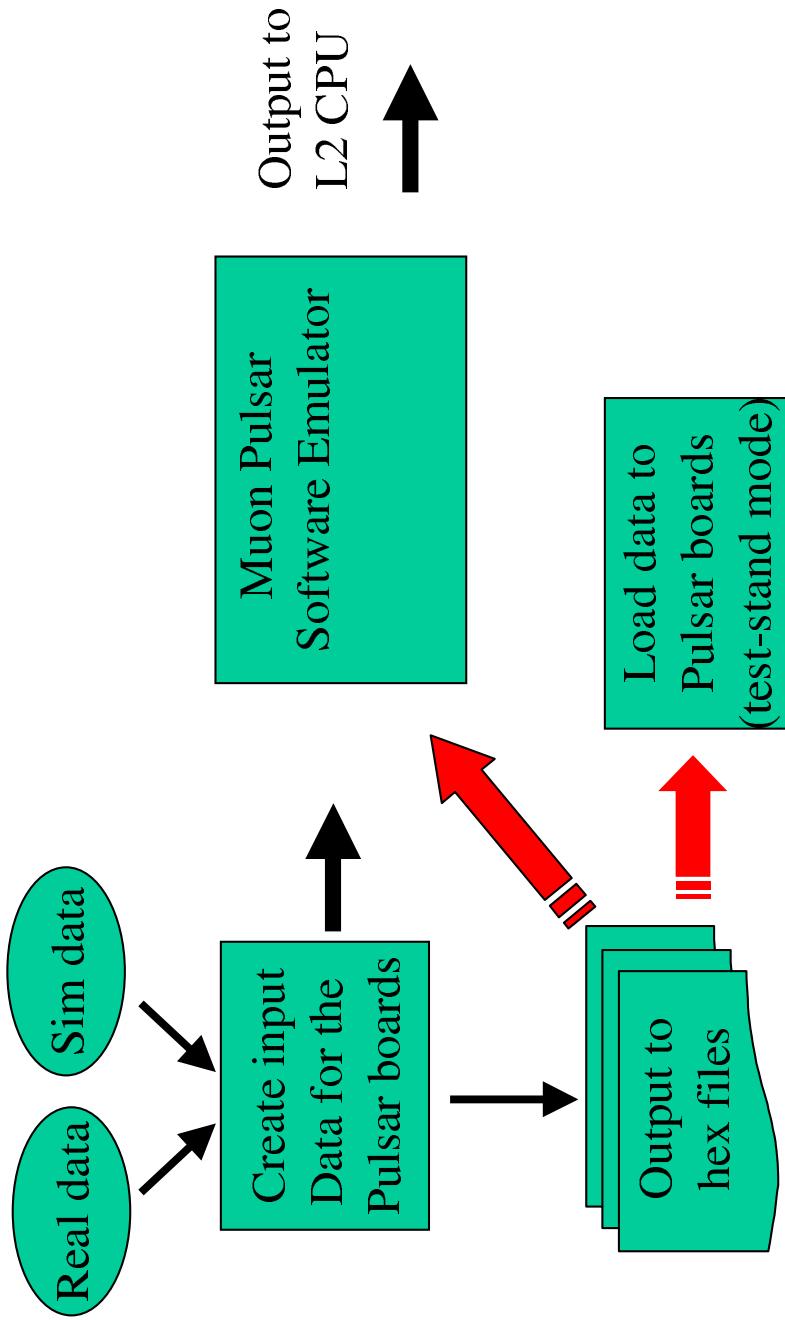


Pulsar Simulation Progress

- Frans has written a complete simulation package (in AC++ environment) for the muon path.
- The simulation package has been very helpful for Sakari (for firmware development) and Burkard (for testing the Pulsar boards).



Diagnostic Code

- Frans has extended his simulation code to include diagnostic capability:
 - Checking for errors between data sent from L1 and data received by the Pulsar board (**done and tested!**),
 - Compare output of the Pulsar board with prediction from the simulation code,
 - Check for discrepancy between the output of Pulsar board and the data received by the L2 decision processor.
- The diagnostic portion of the simulation code will ultimately be included in TrigMon for online monitoring.
- The diagnostic code is being used to look at the data from the L1 muon trigger (12 matchbox and 4 prematch fibers).

Looking at the L1 Muon Fiber Data

- We have a Pulsar crate setup in the trigger room. The crate contains a muon Pulsar board, which is capable of receiving data from the 16 L1 muon fibers.
- Early this week, we took a Cosmic run with the Pulsar board fully integrated in the DAQ system. The data in the L2 buffer of the Pulsar board were readout with the rest of the detector and trigger system. The L2 buffer contains raw data from the 16 input muon fibers. We then compare offline, the data sent from L1 muon boards (TCMD bank) with data received by the Pulsar board (T2PD bank).
- Initially we were very surprised by the number of bit errors. There were errors for every single event. Luckily, the run was taken with software event builder (pseudo myron mode) and we were able to study the problem.

MUON MATCHBOX AND PREMATCH DATA (Run # 166201 Event # 30 L2Buf # 1):

T2PD Matchbox: fiber#1:

00808080 00808080 00808080 00808080 00808080 00808080 00808080 00808080
00808080 00808080 00808080 00808080 00808080 00808080 00808080 00808080
00808080 00808080 00808080 00808080 00808080 00808080 **00808080** **00808080**
00808080 00808080 00808080 00808080 00808080 00808080 00808080 47fffff

TCMD Matchbox: fiber#1:

00809080 00808080 00808080 00808080 00808080 00808080 00808080 00808080
00808080 00808080 00808080 00808080 00808080 00808080 00808080 00808080
00808080 00808080 00808080 00808080 00808080 **008880a0** 00808080 **00f1fc8**
00808080 00808080 00808080 00808080 00808080 00808080 00808080 47fffff

MUON MATCHBOX AND PREMATCH DATA (Run # 166201 Event # 31 L2Buf # 2):

T2PD Matchbox: fiber#1:

00809080 00808080 00808080 00808080 00808080 00808080 00808080 00808080
00808080 00808080 00808080 00808080 00808080 00808080 00808080 00808080
00808080 00808080 00808080 00808080 00808080 **008880a0** 00808080 **00f1fc8**
00808080 00808080 00808080 00808080 00808080 00808080 00808080 47fffff

TCMD Matchbox: fiber#1:

00808080 00808080 00808080 00808080 00808080 00808080 00808080 00808080
00808080 00808080 00808080 00808080 00808080 00808080 00808080 00808080
00808080 00808080 00808080 00808080 00808080 00808080 00808080 **07ffe080**
00808080 00808080 00808080 00808080 00808080 00808080 00808080 47fffff

This pattern showed up in the
next buffer#1 event.

Looking at the L1 Muon Fiber Data

- Simple explanation for the observed behavior is that the L2 buffer bits are inverted. The L2 buffer bits on the VME backplane is active low. If the bits are not inverted correctly in the firmware, then we have:

Buffer 00 (0) à	Buffer 11 (3)
Buffer 01 (1) à	Buffer 10 (2)
Buffer 10 (2) à	Buffer 01 (1)
Buffer 11 (3) à	Buffer 00 (0)

- Ted and Sakari have checked the Pulsar firmware and concluded that the inversion is done correctly on the Pulsar board. Eric James looked at his firmware yesterday and concluded that the buffers are swapped in the matchbox and prematch cards at the output stage (TCMD bank is not affected by the bug). He will fix the firmware ASAP.

Second Look at the L1 Muon Fiber Data

- Two days ago, we took another cosmic run (5K events), this time in true myron mode. Assuming the L1 muon data is “buffer swapped”, we updated the diagnostic code to correctly map the events.
- We then compare the TCMD (L1muon) data with the T2PD (Pulsar) data:
 - Still getting error on every event. However, they all come from matchbox fiber #3. (This is not a surprise since we have seen the stuck bit earlier using the logic analyzer, see Pulsar e-log entry),
 - The data from the remaining 15 channels agree **100%** of the time between TCMD and T2PD (for 5K events).

Next:

- We will repeat the study after the firmware fix in the L1 muon boards.
- When the problem with the hardware event builder is solved, we will take high statistics runs to look for low level errors.
- We also want to start comparing XTRP trklist data and T2PD bank (when the readout code is ready).